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6. AUTHOR(S)

Dr. Robert Steinman

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ORAA - University of Maryland
College Park, MD. 20742-5141

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AFOSR/NL Attn: Lt. Col. D. Collins
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13. ABSTRACT (Maximum 200 words)

This grant supports the interdisciplinary training (psychology, neuroscience and computer science) of an advanced graduate student (Julie Epelboim), who is earning a PH.D. in Psychology by participating as a graduate Research Assistant on AFOSR Grant 91-0124, entitled "Coordinated action in 3-D Space". Her doctoral thesis will be derived from problems investigated in this "parent" grant which has two main thrusts. First, it tests alternative hypotheses about the mechanism that controls the gaze-shifts associated with arm motions, when an unrestrained, seated subject manipulates objects within arms's reach. The second thrust is to study the speed and accuracy of visually-guided hand movements and the correlation of these performance measures with binocular gaze-errors. Advancing knowledge in this rather technical interdisciplinary research area requires developing expertise in the areas included in Epelboim's AASSERT training program, which has been designed so as to contribute to the goals of the parent grant and at the same time prepare her for a productive career as a research scientist during the next 3 or 4 decades.

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Objectives: This grant supports the interdisciplinary training (psychology, neuroscience and computer science) of an advanced graduate student (Julie Epelboim), who is earning a Ph.D. in Psychology by participating as a graduate Research Assistant on AFOSR Grant 91-0124, entitled "Coordinated action in 3-D Space". This grant has two main thrusts.

First, it tests alternative hypotheses about the mechanism that controls the gaze-shifts associated with arm motions, when an unrestrained, seated subject manipulates objects within arms's reach. Two quite different mechanistic models have been proposed, namely, (a) an "on-line" feedback model and (b) a ""single packet" model that bases accurate gaze control on pre-planned patterns of coordinated movements of the head and eyes.

The second thrust is to study the speed and accuracy of visually-guided hand movements and the correlation of these performance measures with binocular gaze-errors. In general terms, how well must you fixate a 3-D pattern of targets as you execute a visually-guided arm movement rapidly and accurately while moving naturally in 3-D space and performing a task that requires a sequence, rather than a single, visually-guided arm movement?

Little is known about these problems because, until recently, it had not been possible to measure binocular gaze-errors accurately as a subject manipulates nearby objects in 3-D space with the head and torso free to move naturally. Advancing knowledge in this rather technical research area requires developing expertise in the areas included in Epelboim's AASSERT training program, which has been designed so as to contribute to the goals of the parent grant and at the same time prepare her for a productive career as a research scientist during the next 3 or 4 decades.

Accomplishments since last report (*)

Graduate School Status:

Completed Research Competency and admitted to Doctoral Program in March, 1992.
Completed Comprehensive Exam and admitted to Doctoral Candidacy, June 1992.
*Completed all required course work, Fall, 1993.
*Doctoral Topic approved and Examining Committee formed May 1994.
Expected completion date for Ph.D is May 1995.

Publications:

Epelboim, J. and Kowler, E. (1993) Slow control with eccentric targets: Evidence against a position corrective model. Vision Research, 33, 361-380.

*Epelboim, J., Booth, J. R., and Steinman, R. M. (1994). Reading unspaced text: Implications for theories of reading eye movements. Vision Research (in press).

*Pizlo, Z., Rosenfeld, A. and Epelboim, J. (being revised) Exponential model of the time-course of size processing. Vision Research.

Refereed Conference Proceedings:

*Epelboim, J., Collewijn, H., Edwards, M., Erkelens, C.J., Kowler, E., Pizlo, Z. & Steinman, R.M. (1994) Natural oculomotor performance in looking and tapping tasks. Proceedings of the Cognitive Society (in press).

Published abstracts:

Kowler, E., Pizlo, Z., Epelboim, J. and Steinman, R.M., 1990. Slow control is driven by velocity, not position signals. Investigative Ophthalmology and Visual Science Supplement, 31, 532.

Pizlo, Z., Rosenfeld, A. and Epelboim, J., 1991. Speed-accuracy tradeoff in a spatial-interval identification task. Investigative Ophthalmology and Visual Science Supplement, 32, 1272

Epelboim, J., Booth, J., Airey, D. and Steinman, R.M., 1992. Eye movements while reading unspaced text. Investigative Ophthalmology and Visual Science Supplement, 33, 1358. Epelboim, J.,

Collewijn, H., Edwards, M. E., Erkelens, C.J., Kowler, E., Pizlo, Steinman, R.M. (1993) Coordination of eyes, head and hand in a natural 3-D tapping task. Investigative Ophthalmology and Visual Science Supplement, 34, 1502.

*Epelboim, J., Collewijn, H., Edwards, M. E., Erkelens, C.J., Kowler, E., Pizlo, Steinman, R.M. (1994). Coordinated movements of the arm and head increase gaze-shift velocity. Investigative Ophthalmology and Visual Science Supplement, 35, 1550.

* **Invited Lecture:** Participated in a Symposium at the Neural Control of Movement Meeting in Maui, HI, April 13-18. Symposium Title: "Coordination of eyes, head and hands in natural tasks". Other speakers: Prof. Dr. H. Collewijn, Physiology, Erasmus University Rotterdam; Prof. Dr. C. J. Erkelens, Medical Physics, Utrecht University and Prof. M. Hayhoe, Center for Visual Science and Psychology, Rochester University.

Award: Association for Research in Vision and Ophthalmology/National Eye Institute Travel Award to attend the annual ARVO Meeting in Sarasota, Florida, May 1992.

Participating Professionals:

Robert M. Steinman	Prof., Psychology, UMCP
Eileen Kowler	Prof., Psychology, Rutgers U.
Zygmunt Pizlo	Asst. Prof., Psychology, Purdue U.
Han Collewijn	Prof., Physiology, Erasmus U. Rotterdam, NL
Casper Erkelens	Prof., Medical Physics., Utrecht U., NL
Julie Epelboim	Doctoral Candidate, Psychology , UMCP